ENGINEERING & MANAGEMENT EXAMINATIONS, DECEMBER – 2007
CIRCUIT THEORY & NETWORKS
SEMESTER – 3

Time : 3 Hours]

(EIE)

[Full Marks : 70

GROUP – A
(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following :   10 × 1 = 10

   i) A four terminal network constitute a

   a) one port network   b) two port network

   c) four port network   d) none of these.

   ii) A capacitor C at time $t = 0 +$ with zero initial change acts as a

   a) short circuit   b) open circuit

   c) current source   d) voltage source.

   iii) Kirchhoff's law fail in case of

   a) Linear networks

   b) Non-linear networks

   c) Dual networks

   d) Distributed parameter networks.

   iv) The voltages v_1 & v_2 in the given circuit are

   a) 6v, 4v   b) 4v, 6v

   c) 5v each   d) none of these.

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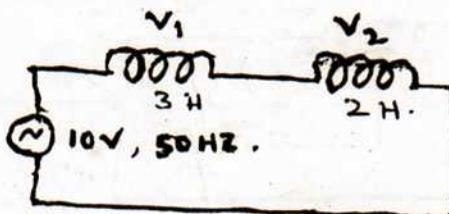
v)   It is given that $Z_1 = (2 + j\,3)\,\Omega$ & $Z_2 = (6 + j\,3)\,\Omega$, Then $|\,Z_1 + Z_2\,|$ is

    a) $10\,\Omega$ b) $14\,\Omega$

    c) $11\,\Omega$ d)   none of these.

vi) The phasor combination of resistive power & reactive power is called

    a)   true power   b)   apparent power

    c)   reactor power   d)   average power.

vii) The node method of circuit analysis is based on

    a)   KVL & ohm's law   b)   KCL & kVL

    c)   KCL, kVL & ohm's law   d)   KCL & ohm's law.

viii) Maximum power transfer occurs at a

    a)   100% efficiency   b)   50% efficiency

    c)   25% efficiency   d)   75% efficiency.

ix) Transient current in a RLC circuit is oscillatory when

    a) $R = 2\sqrt{\dfrac{L}{C}}$ b) $R = 0$

    c) $C = R > 2\sqrt{\dfrac{L}{C}}$ d) $R < 2\sqrt{\dfrac{L}{C}}$.
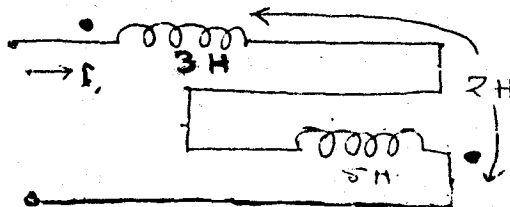
x)   Two inductors are connected as shown in the following fig. What is the value of the effective inductance of the combination ?

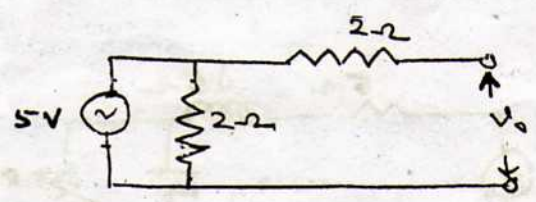   a)   8 H   b)   4 H

    c)   10 H   d)   6 H.

xi)   What is the phase angle between inductor current & the applied voltage in a parallel RL circuit ?

a)   0°   b)   45°

c)   90°   d)   30°.

xii) Thevenein's equivalent resistance of the given circuit is

a)   2Ω   b)   0Ω
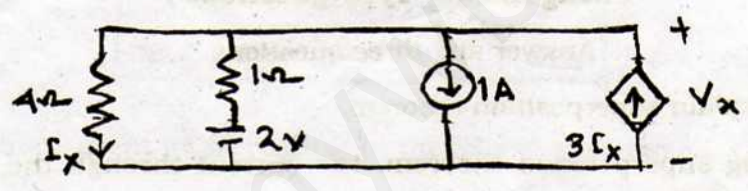
c)   1Ω   d)   α.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following.   3 × 5 = 15

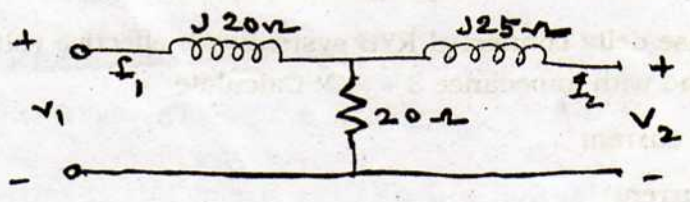2.   Determine the value of I_x & V_x.

3.   a)   What is linear time invariant system ?
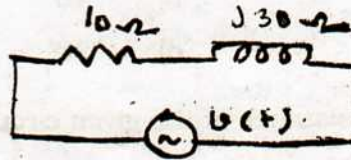
b)   What is impulse response ?

c)   The response of a system is given by $y(t) = c \times (t) + x^3(t)$. State whether the system is time-invariant as time-variant.

4.   Determine the Z-parameter of the network shown in the *fig.* Is it a reciprocal network ?
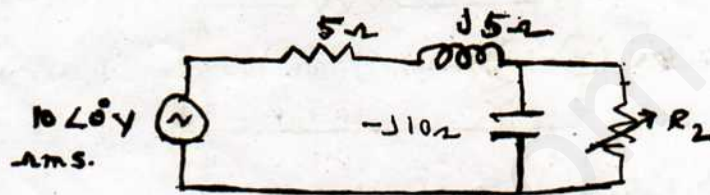
5. In the circuit shown below, a voltage v (t) = 50 sin (wt + 30°) is applied. Determine the true power, reactive power & power factor.

6. In the network shown below, find R_L which will dissipate maximum power. Determine also maximum power.
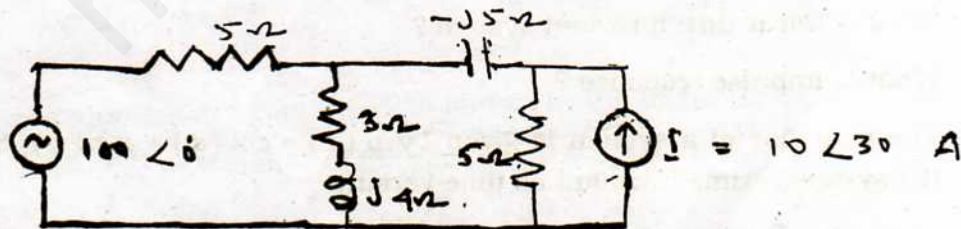

GROUP – C

(Long Answer Type Questions)

Answer any *three* questions.   3 × 15 = 45

7. a) State & explain superposition theorem.

   b) Find using superposition theorem, the current through the capacitor having reactions – j5 Ω.
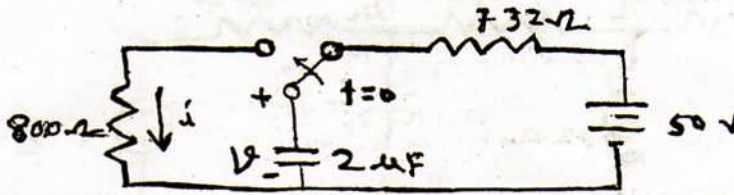

5 + 10

8. a) Describe the method of measuring reactive power.

   b) A three phase delta connected RYB system with effective voltage of 400 V, has a balanced load with impedance 3 + j4Ω. Calculate

   i)   phase current

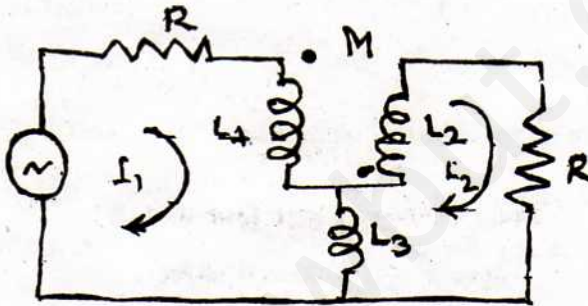   ii) line current

   iii) power in each phase.

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c)   Determine $V(0^+)$, $i(0^+)$, $i(2\ ms)$ for the following circuit :
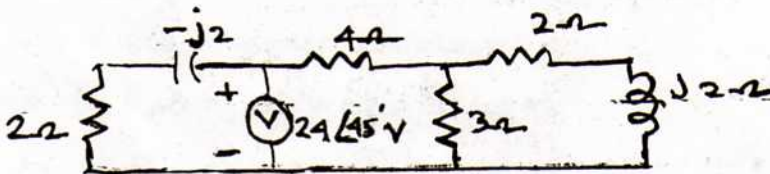

5 + 5 + 5

9. a)   Determine for a two-port network the condition of reciprocity & condition of symmetry in terms of h-parameters.

b)   Draw the voltage phases & current phases of a series R-L circuit. Draw also the impedance triangle.

c)   Find the ratio of I_1 & I_2 for the following circuit :

5 + 5 + 5

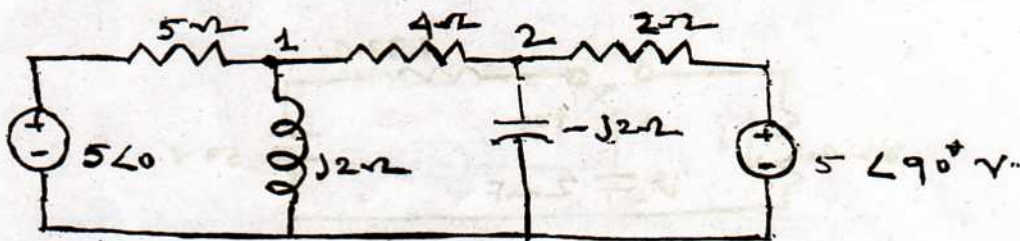10. a)   Determine current in 3Ω resistor in the following *figure* :

b)   Find two elements of a series circuit having current $i = 4\cdot24\cos(5000\,t + 45^\circ)$A, power 180 w & power factor 0·8 lagging.

c)   An RLC series circuit has R = 100Ω, L = 500 mH & C = 40 μF. Calculate resonant, lower & upper half power frequency.

8 + 4 + 3

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11. a) For the network shown, determine the node voltages.

   b) Determine the step response of series R-L-C circuit. Draw the wave forms of the response.

   c) Determine Q factor of a series R-L-C circuit.   5 + 7 + 3

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END